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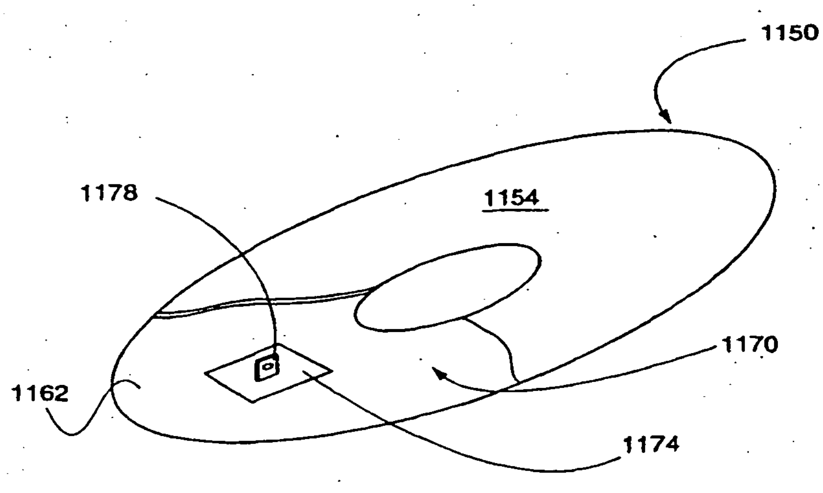
(54) Title: COPY PROTECTABLE OPTICAL MEDIA DEVICE AND METHODOLOGY THEREFOR



(57) Abstract

A method and system is disclosed for purposefully modifying the accessibility of information encoded upon an optical medium (1150) for indicating a state or history of an item associated therewith. In one embodiment, the modifying of the optical medium (1150) includes a device (1170) for purposefully damaging the optical medium (1150) when the information is initially accessed so that upon subsequent attempts at accessing the information on the optical medium (1150), the previous access to the information can be detected by the access errors purposefully generated. Thus, the present invention provides an effective technique for limiting illegal duplication and/or use of, e.g., software, movies, and music on compact disks and digital versatile disks. Moreover, the present invention is also useful for verifying the authenticity of persons and/or financial transaction cards during financial transactions.

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COPY PROTECTABLE OPTICAL MEDIA DEVICE AND METHODOLOGY THEREFOR

FIELD OF INVENTION

The present invention broadly relates to data storage media for use with optical scanning machines, which data storage media are adapted to limit access to information stored thereon. More particularly, the present invention concerns optical disks for use in an optical readout system of a computer to limit continual or repeated unrestricted access to stored data by the optical readout system. A method is also provided for limiting access to data stored in an optical medium environment.

BACKGROUND OF THE INVENTION

The computer industry has long been plagued by the illegal misappropriation of software products. The Software Publisher's Association (SPA), an organization with devotes significant resources to tracking and analyzing piracy problems, has determined that in 1994 alone the personal computer software industry lost in excess of $8 billion due to illegal copying of business application software. The SPA further estimated that virtually half of the business software in use in 1994 was pirated, and this estimate does not include the illegal copying of operating systems, education, entertainment or personal productivity software. The piracy problem is particularly acute in more developed markets such as the United States.

Many approaches have been implemented by software producers in an effort to combat piracy. Some of these approaches include encryption, special data formatting complex installation procedures, and passwords, to name only a few. Unfortunately, end user resistance to these anti-piracy schemes has been high because they are plagued

by one or more limitations, such as an inability to "try before you buy", restrictions on the generation of legitimate back-up copies, and password protection techniques which fail once the password is divulged or discovered. The inability of copy protection schemes to win end-user acceptance has been so extreme that many publishers have simply abandoned the effort, choosing instead to rely on the integrity of their customers to abide by copyright laws.

The misappropriation of software is rampant irrespective of whether the data storage medium is magnetic or optical. Magnetic storage disks are particularly susceptible to piracy. Commercially available magnetic disks, such as the conventional floppy disk, are read/write/erase memory devices in which data is stored in a magnetizable surface layer as discrete patterns of magnetism. Information is stored and retrieved by a read/write head which contains a coil wound around an iron core.

While the magnetic recording medium remains the most popular, there has been a growing trend in recent years to utilize an optical medium environment for the storage and retrieval of data. The reason for this trend is readily apparent. A commercially available magnetic floppy disk is only capable of storing 1.44Mb of data, whereas an optical CD-ROM of the same size can have a capacity in excess of 600Mb.

In a typical optical disk for use in a computer's optical readout system, data is stored as a series of lands and pits. This is accomplished by stamping along spiral tracks on a transparent plastic disk, overlaying this with a reflective coating, and thereafter superimposing a protective layer over this coating. Light from a semi-conductor laser is focused onto either the lands or pits from below and the reflected light impinges upon a

photodetector which converts the presence or absence of the pits into a binary electrical signal. Because the focused laser spot is so minute, the amount of information that can be stored onto the surface of the disk is immense. Adjacent tracks need only be spaced apart by approximately .6μm and, hence, 20,000 tracks may be available on a conventional 120 mm diameter (5 inch) optical disk. The electrical signals delivered to the optical readout system correspond to the magnitude of the reflected light which either increases or decreases due to interference and/or diffraction by the preformatted data structures.

In the 1970's, researchers began attempting to encode information on optical disks with lasers, and the video disk was subsequently developed. In the 1980's, more sensitive materials that could be encoded with a low power diode laser were developed. These diode lasers, operating at a wavelength of approximately 800 nm, are now universally employed to read audio and computer CD's. Following the advent of compact disks which are capable of being read with a laser diode, researchers have now endeavored to develop a marketable compact disk upon which data can be recorded by an end user. The benefit of this capability, as discussed above, is that optical laser recording provides a much higher information density than magnetic recording.

Presently, there is a write once and read many times (WORM) compact disk. This compact disk utilizes a dye that irreversibly changes state when exposed to a high power laser diode and maintains this state when read with a low power reading laser. As such, detection of the encoded data by the optical readout system does not affect the encoded data.

It is anticipated that the next generation of optical disks will be capable of being written on, read, erased and

rewritten on, etc. many times, similar to a magnetic disk. A photochromic material, or chromophore, is attractive for this purpose. Photochromism is the phenomenon whereby the absorption spectrum of a molecule or crystal changes reversibly when the material is irradiated by light possessing certain wavelengths. Thus, for example, a colorless compound may change its molecular state to a quasi-stable colored state when radiated by ultraviolet (UV) light, yet be returned to the colorless state upon exposure to visible light. Both organic and inorganic materials which exhibit these properties have been known for years.

Recently, photochromic compounds have attracted much attention in the field of optical recording. As discussed in Jun'Etsu Seto, Photochromic Dyes, the photochromic materials initially studied for such an application did not have significant sensitivity in the infrared region near 800 nm, the wavelength region of conventional laser diodes. Seto recognizes, however, that a specific class of photochromic compounds, known as spiropyrans, can be manipulated to exhibit improved sensitivity in the infrared region. Specifically, Seto discusses a class of photochromic spiropyrans with benzothiopyran units in the molecular framework and concludes that the synthesized spirobenzothiopyran is well suited to the requirements of erasable optical recording media for systems using conventional laser diodes.

Another dye of the spiropyran class, having the chemical composition 6-nitro-1'3'3'-trimethylspiro[2H-1-benzothiopyran-2,2'-indoline], or 6-nitro-1-SBIPS for short, is discussed in Tarkka, Richard U., Talbot, Marc E. , et al. , "Holographic Storage in a near-ir sensitive photochromic dye", Optic Comm. 109, 54-58 (1994). This article discusses the use of 6-nitro-1-S-BIPS for use in the holography field wherein the dye becomes colored when

exposed to light having a wavelength of 780 nm. The film returns to a quasiclear state upon exposure to an ultraviolet light source at 337 nm.

It is anticipated, based on these recent developments, that the conventional magnetic disk will eventually become obsolete due to the recent developments in optical storage technology. Concurrent with this anticipated phaseout of magnetic disks will be a need to adequately address the piracy issues which have for so long plagued the software industry so that the illegal misappropriation of proprietary rights can be thwarted. Accordingly, while past research has concentrated on utilizing photochromic materials for the recording of information on compact disks, the present inventors have realized that similar photochromic materials may also be used to protect the compact disk against illegal copying and distribution. In addition, the present inventors have also recognized that certain other photoreactive materials, as well as oxygen reactive materials, may be employed for this purpose. That is, compounds such as these may be used to deny access to a specially coated compact disk beyond one or more authorized uses. That is, such compounds, when applied as a coating on a disk, operate to effectively change its light transmissive properties upon exposure to a low power reading laser, thereby darkening the coating on the disk and rendering data undetectable by an optical readout system. Moreover, the inventors have also recognized other optical media data protection techniques for the present invention that also address the unrestricted duplication of information as discussed hereinabove.

SUMMARY OF INVENTION

It is an object of the present invention to provide a new and useful optical medium, such as an optical disk, and system therefor which is adapted for use with an optical

readout system of, for example, a computer, wherein the readout system includes a light source operative to produce an interrogating beam of light for reading data structures on the optical medium.

Another object of the present invention is to provide such an optical medium which is particularly adapted to prevent unrestricted access to encoded information thereon by an optical readout system, wherein the information may be, for example, graphical data, video data, audio data, text data, and/or a software program.

Another object of the present invention is to use the error detection capabilities of a conventional optical medium reader for: (a) determining a status of an optical medium provided by the present invention, and/or (b) verifying an object or person as authentic. That is, it is an object of the present invention to use the errors detected on the optical medium for (a) and/or (b) above. For example, the total number of errors detected in a predetermined area of the optical medium, the density of the errors detected in a predetermined location of the optical medium, and/or the pattern of errors in a predetermined area of the optical medium provides, according to the present invention, sufficient information for (a) and/or (b) above.

Another object of the present invention is to provide verification or authentication of information provided on or with the novel optical medium of the present invention. For example, the present invention may be used for verifying the authenticity of an optical disk having an audio and/or multimedia presentation thereon. Additionally, when the optical medium of the present invention is incorporated into, for example, a financial transaction card, the card can be verified as authentic.

Another object of the present invention is to provide verification or authentication of a user that is, for

example, desirous of making an electronic financial transaction such as on the Internet.

A further object of the present invention is to provide a new and useful optical disk which is relatively easy to manufacture without substantial increases in costs.

Yet another object of the present invention is to provide a methodology of limiting access to information stored on an optical medium for use in a computer's optical readout system.

Still a further object of at least some embodiments of the present invention is to provide an optical disk which is particularly constructed so that an end user is unaware of the disk copy protection features until after they have been performed.

A first collection of embodiments of the present invention accomplishes these objectives by providing an article of manufacture (e.g., an optical disk) that is adapted to be encoded with data and further adapted so that duplication of the data by an optical scanning machine (i.e., an optical readout system) may be restricted. The article of manufacture comprises a substrate fabricated from a selected material, with a surface thereof provided with the data. A reactive compound is formed as a coating on at least a portion of the substrate surface and the reactive compound operates to change from an optically transparent state to an optically opaque state in response to irradiation for an accumulated duration of time by infrared light having desired characteristics, thereby to prevent light from the optical scanning machine from penetrating the reactive compound and to render the data undetectable by the optical scanning machine.

More particularly, an optical disk is provided which is adapted for use in an optical readout system of a computer wherein the optical readout system includes a light source operative to produce an interrogating beam of

light for reading data structures. Broadly, the optical disk according to the first collection of embodiments of the present invention includes an inner layer having an upper surface and a lower surface, with the lower surface thereof encoded with information stored as a plurality of data structures that are readable by the interrogating beam of light. The outer layer is disposed in a confronting relationship with the lower surface, and a film of a reactive compound is superimposed over at least some of these data structures. The reactive compound is selected to be of a type which is operative to change physical characteristics in response to a selected stimulus, thereby to affect readability of the data by the interrogating beam.

Preferably, the optical disk includes a layer of reflective material interposed between the lower surface and the reactive compound. This reactive compound may be supported on a lower surface of the disk's second layer and have a thickness of approximately 2-5 microns or, alternatively, it may be interposed between the lower surface and the disks outer layer. The lower surface is preferably contoured to include a sequence of pits and lands which define the plurality of data structures, with the reactive compound superimposed over at least some of these pits and lands.

The selected stimulus to which the reactive compound responds is an ambient environment selected to be either visible light, infrared light, light and oxygen, or simply air. Where the stimulus is light alone, the reactive compound may be a photoreactive material and preferably one selected from a spiropyran class of photochromic compounds. One such compound may be 6-nitro-1'3'3'-trimethylspiro-[2H-1benzothiopyran-2,2'-indoline] , or 6-nitro-1-S-BIPS for short. Such a photochromic compound is operative to change from an optically opaque or darkened condition in response

to an interrogating beam wavelength of approximately 780 nanometers (nm) and thereafter return to an optically transparent condition in response to a irradiation by a beam of light having a wavelength of approximately 337 nanometers (nm).

Where the stimulus is a combination of light and oxygen, the reactive compound would therefore be photoreactive with oxygen and preferably operate to change its physical characteristics in response to an interrogating beam of light having a wavelength of approximately 650 nanometers (nm), which *is* encountered with digital versatile disk (DVD) readers.

Where the environmental stimulus is simply air (more precisely, oxygen), the reactive compound may be one which is operative after an accumulated duration of time to oxidize and alter an optical characteristic thereof. For example, such a reactive compound would change from an optically transparent condition to an optically opaque condition wherein it absorbs light having a wavelength within a desired range. This wavelength could be either 650 nanometers (nm), as discussed above, but may also be in the range of 780 to 820 nanometers (nm). The oxidizing reactive compound may be selected from a group of dyes consisting of methylene blue, brilliant cresyl blue, basic blue 3 and toluidine blue O.

A methodology of limiting access to data stored on an optical medium such as an optical disk is provided by the first collection of embodiments. Broadly, this methodology comprises the steps of rotating an optical disk in a disk drive at a selected rotational speed, with the optical disk including a substrate layer encoded with information stored thereon as a plurality of readable data structures. A reactive compound is preferably superimposed over at least some of these data structures and this reactive compound operates in an ambient environment containing oxygen to

change optical transmission in response to irradiation for an accumulated duration of time by light having a beam wavelength that is within a selected range. An interrogating beam of light having a beam wavelength that is within the selected range is directed toward the substrate layer and through the reactive compound for the accumulated duration of time.

The step of directing the interrogating beam may be accomplished by directing the beam at the substrate layer for a continuous interval of time that is sufficient to cause the change in optical transmission through the optical medium. Alteratively, the interrogating beam may be directed at the substrate layer for a plurality of discrete intervals of time sufficient to cause such change. Where this is the case, it is contemplated that the interrogating beam may be selectively advanced radially across an outermost surface of the optical disk until the beam interacts with the reactive compound for the plurality of discrete intervals of time. The interrogating beam's wavelength may be approximately 780 nanometers (nm) where a CD-Rom optical disk is utilized, or have a wavelength of approximately 650 nanometers (nm) which is the wavelength employed for digital versatile disks (DVD). Preferably, the interrogating beam also has an intensity of approximately 1 milliwatt (mW) of power, which is typically encountered in conventional optical readers.

In a second collection of embodiments of the present invention, a method and apparatus are provided for prohibiting unrestricted duplication of information on an optical medium such as an optical disk, wherein the user manually affects a physical change to the optical disk during an initial use of the optical disk. For example, the user may activate or perform a predetermined procedure for rendering one or more predetermined areas or locations of the optical disk unreadable or more error prone. This

in effect "marks" the optical disk both visually to the user and computationally to a program for accessing information on the optical disk (e.g., graphical data, video data, audio data, text data and/or a software installation program) as having been previously used for accessing the information on the optical disk. Thus, in a subsequent attempt to access the information on the optical disk (e.g., a subsequent attempt to view a multimedia presentation such as a movie, or a subsequent attempt at reinstallation of a software application on the optical disk), it is possible to detect that the information on the optical disk has been previously accessed due to a change in the information on the disk that is able to be read by an optical reader. For example, the optical reader may detect a greater number of read errors than when the optical disk was first accessed for information retrieval.

Alternatively, in other embodiments of the present invention, instead of purposefully creating unreadable portions of the optical disk, a converse method and apparatus may be employed wherein a predetermined portion of the optical disk is initially unreadable and subsequently becomes readable. That is, a mask or covering may be attached to the optical disk during manufacture so that a predetermined portion of information on the optical disk is initially unreadable by an optical reader, but upon initial use of the optical disk, the user physically removes or changes the mask, thereby allowing a sufficient amount of the previously unreadable portion underneath the mask to be read. Accordingly, optical disk accessing software can be performed that detects a state change in the optical disk due to the removing or changing of the mask.

It is a further aspect of at least some embodiments of the present invention that an encoded identifier is provided to a user upon first use of an optical medium of

the present invention. Such an encoded identifier is particularly useful for prohibiting unwanted duplication and/or use of commercial software since the identifier is derived from a unique physical change of the optical disk, and, for example, serial numbers of the installation computer. Thus, the encoded identifier, when supplied during a reinstallation attempt and decoded, allows the present invention to determine whether the user is attempting to install the software on a computer different from the original installation. Thus, upon detecting a state change indicating the software has been previously installed, the present invention may restrict various kinds of access to the information on the optical medium. In particular, if the optical disk provides software programs that may be installed on a user's computer, installations beyond the initial installation may be prohibited if the installation is not on the same computer as the initial installation.

Other collections of embodiments of the present invention are also provided hereinbelow. In particular, collections of embodiments are described relating to verification and/or authentication of financial transaction cards or financial transactions.

These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of the exemplary embodiments of the present invention when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a perspective view of an optical readout system utilizing an optical disk (shown in partial phantom) according to the present invention;

Fig. 2 is a side view in elevation, and in partial cross-section, showing the optical readout system's interrogating beam positioned beneath a first type of data

structure stored on an optical disk according to a first exemplary embodiment of the present invention;

Fig. 3A is an enlarged cross-sectional view of area "A" in Fig. 2;

Fig. 3B is an enlarged cross-sectional view of area "A" in Fig. 2 after an accumulated duration of time so that the reactive compound associated with the optical disk of the first exemplary embodiment of the present invention has undergone a change in its physical characteristics;

Fig. 4 is a side view in elevation, and in partial cross-section, showing the optical readout system's interrogating beam positioned beneath a second type of data structure stored on the optical disk according to the first exemplary embodiment of the present invention;

Fig. 5A is an enlarged cross-sectional view of area "A′" in Fig. 4;

Fig. 5B is an enlarged cross-sectional view of area "A′" in Fig. 4 after an accumulated duration of time so that the reactive compound associated with the optical disk of the first exemplary embodiment of the present invention has undergone a change in its physical characteristics;

Fig. 6A is an enlarged cross-sectional view of an area "B1" of an optical disk according to a second exemplary embodiment of the present invention, with the optical readout system's interrogating beam positioned beneath a first type of data structure stored thereon;

Fig. 6B is an enlarged cross-sectional view of the same area "B" after an accumulated duration of time so that the reactive compound associated with the optical disk according to the second exemplary embodiment of the present invention has undergone a change in its physical characteristics;

Figure 7A is an enlarged cross-sectional view of an area "B′" of an optical disk according to a second exemplary embodiment of the present invention, with the

optical readout system's interrogating beam positioned beneath a second type of data structure stored thereon;

Fig. 7B is an enlarged cross-sectional view of the same area "B′" after an accumulated duration of time so that the reactive compound associated with the optical disk according to the second exemplary embodiment of the present invention has undergone a change in its physical characteristics;

Fig. 8 is a perspective view, partially pealed away, of a package for containing an optical disk utilizing any one of a variety of reactive compounds according to the present invention; Figure 9 is a bottom plan view showing a variety of applications for the reactive compound associated with an optical disk according to the present invention;

Figs. 10A, 10B and 10C present a flowchart of the steps performed when the present invention is used to install computer software residing on an optical disk that conforms with the inventive aspects of the present invention, wherein the user is required to make a manual change to the optical disk during the first installation using the optical disk;

Figs. 11A and 11B illustrate a manual approach to irreversibly changing the physical characteristics of an optical disk manufactured according to the present invention. That is, the optical disk here includes an additional layer bonded to the optical disk wherein upon removal by the user, the information encoded on the optical adjacent to the additional layer is damaged;

Fig. 12 illustrates the removal of the additional layer (denoted a "ripcord") that is also shown in Figs. 11A and 11B;

Figs. 13A and 13B illustrate an alternative embodiment to the optical disk embodiment of Figs. 11A - 12B for purposefully damaging an optical disk manufactured

according to the present invention. In particular, in Figs. 13A and 13B, a chemical container or sack is bonded to an optical disk so that upon rupturing of the container (during, e.g., an initial optical disk use), the information on the optical disk is purposefully damaged, thereby allowing a subsequent installation process to detect the previous access to the information on the optical disk;

Figs. 14A and 14B illustrates cross-sections of the optical disk of Figs. 13A and 13B, wherein Fig. 14A shows the chemical container prior to rupturing and Fig. 14B shows the chemical container after rupturing;

Figs. 15A and 15B illustrate another alternative embodiment for purposefully damaging an optical disk wherein an external device is used that can etch or scar the optical disk and thereby reduce the readability of disk information in a particular area of the disk;

Figs. 16A and 16B illustrate yet another embodiment of the present invention for purposefully damaging an optical disk manufactured according to the present invention. In the embodiment of these figures, an external device is used for applying one or more chemicals to a particular or predetermined portion of the optical disk and thereby inducing additional read errors from an optical disk reader;

Figs. 17A and 17B illustrate an alternative embodiment of an optical disk manufactured according to the present invention, wherein an additional layer is provided on the optical disk during manufacture for hiding or masking a particular portion of the information on the optical disk;

Fig. 18 illustrates the removal of the additional layer (also denoted a "ripcord") from the optical disk of Figs. 17, wherein the optical disk information masked by the ripcord is now capable of being read by an optical reader;

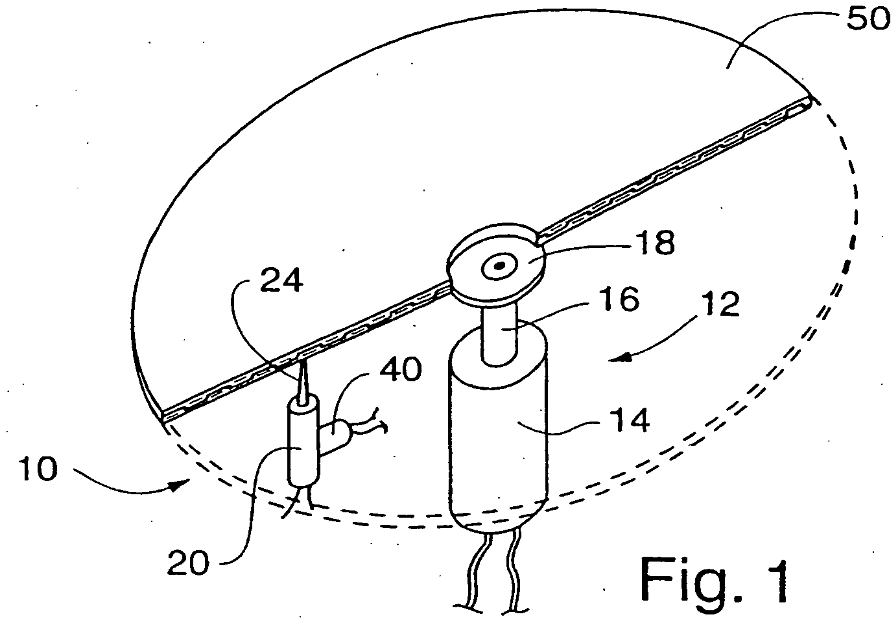

Fig. 1

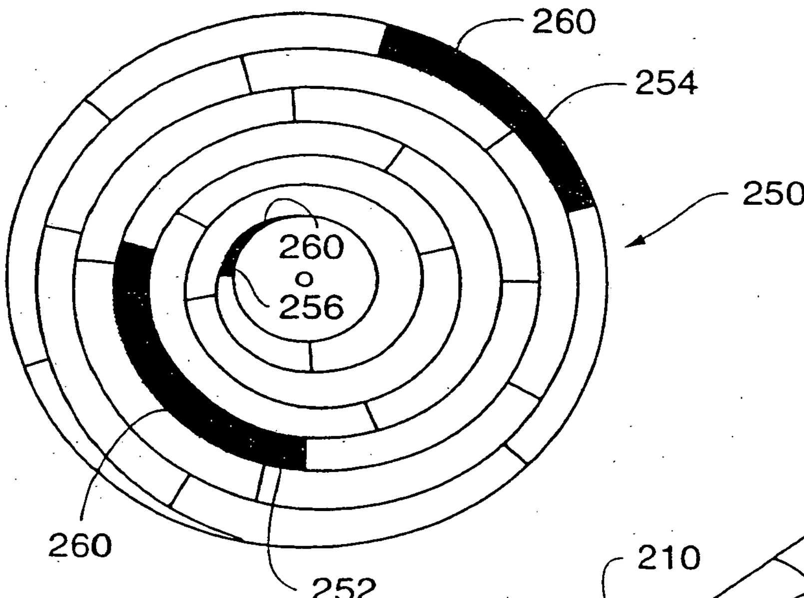

Fig. 9

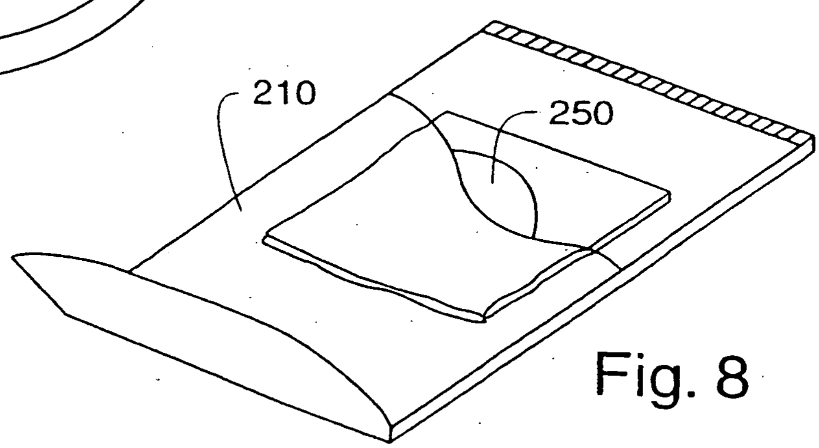

Fig. 8

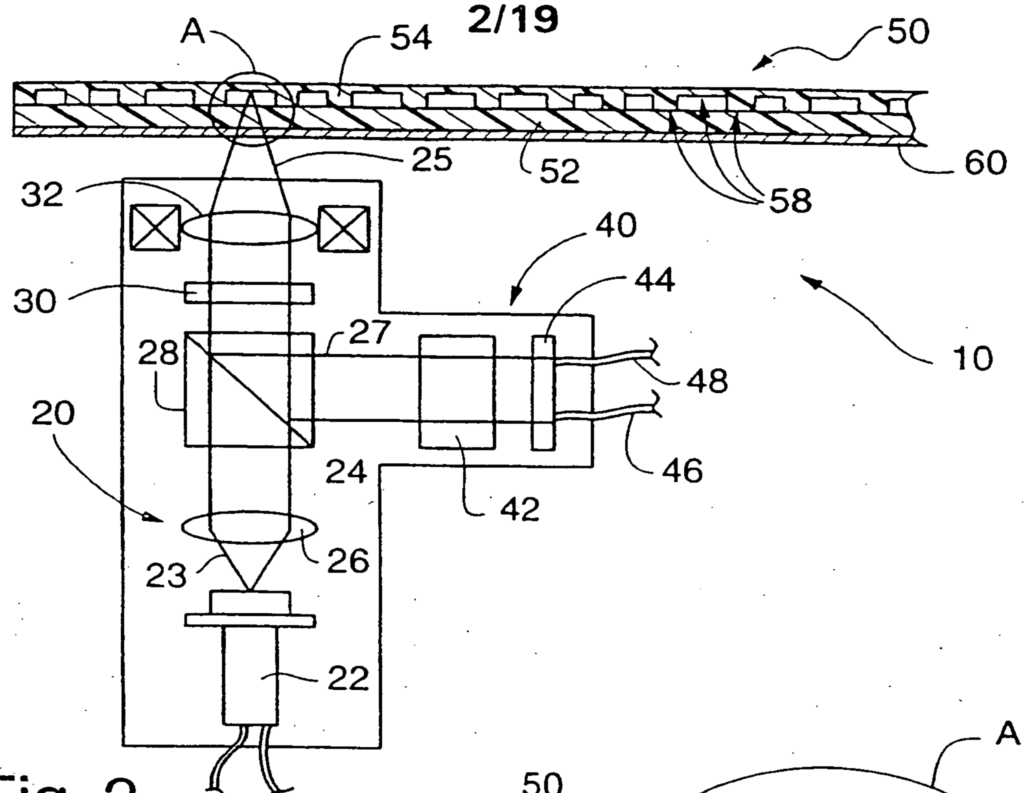

Fig. 2

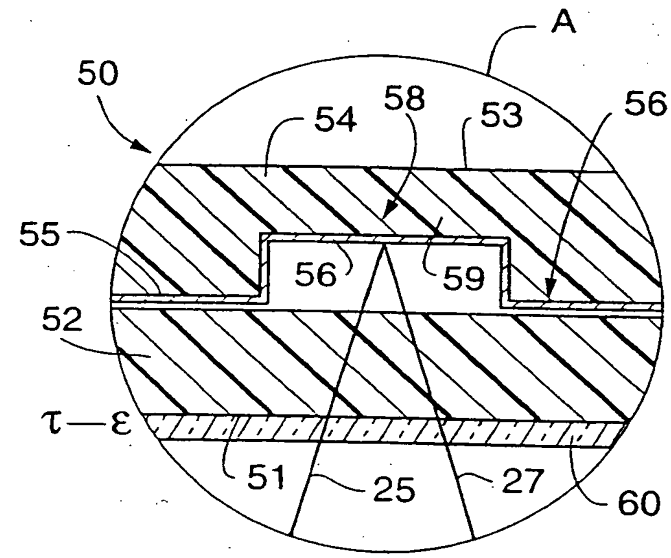

Fig. 3A

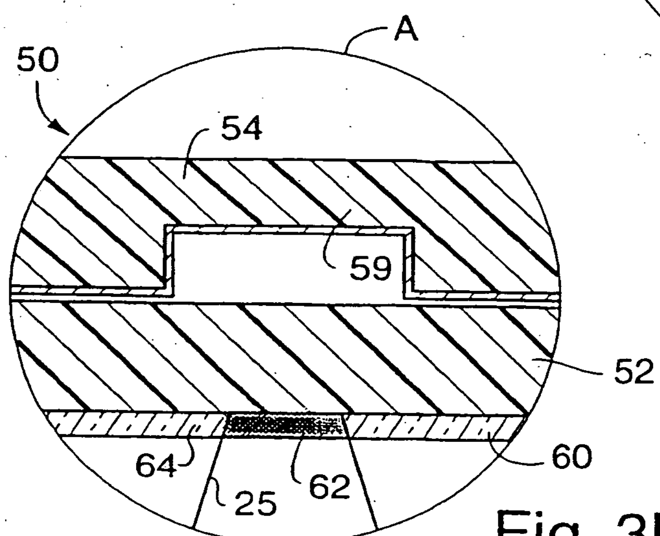

Fig. 3B

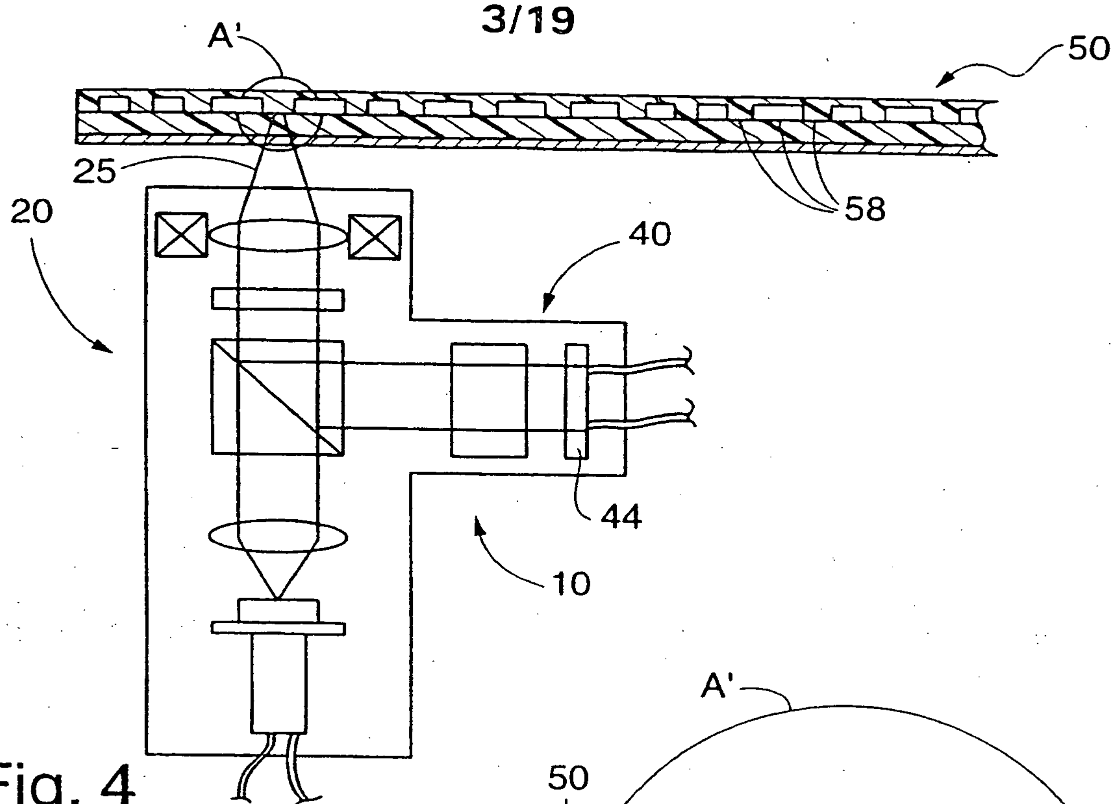

Fig. 4

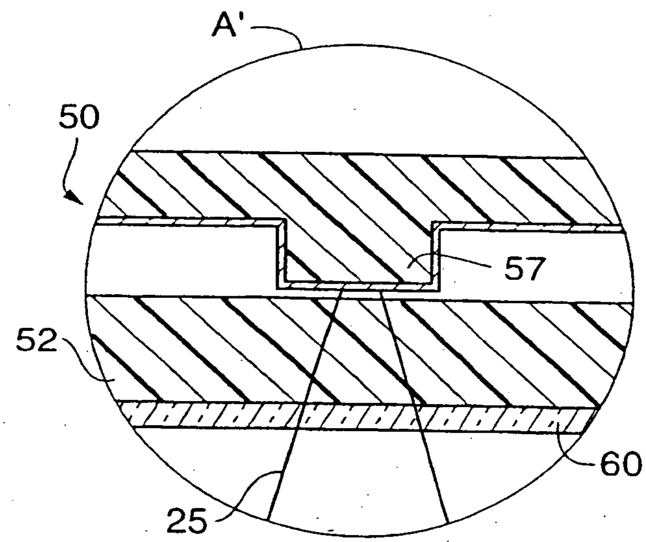

Fig. 5A

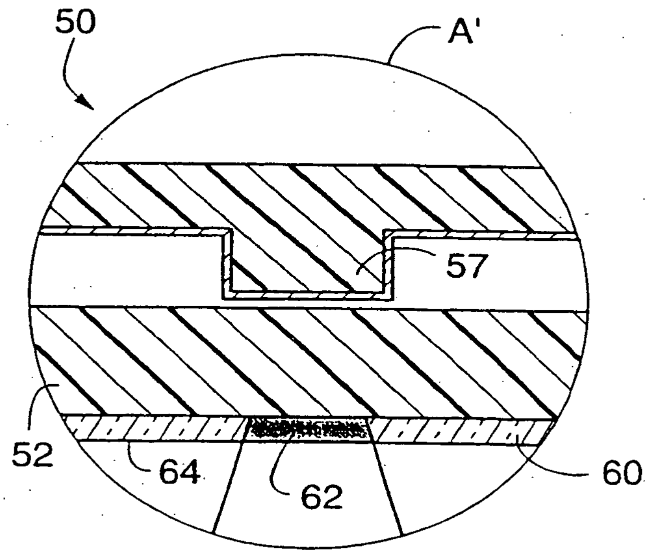

Fig. 5B

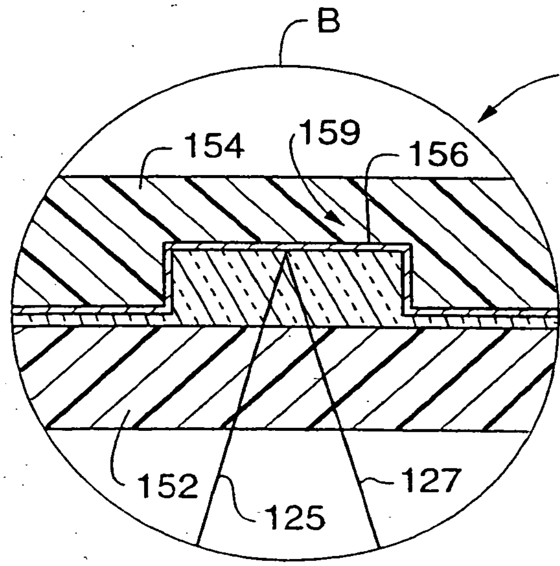

Fig. 6A Fig. 6B

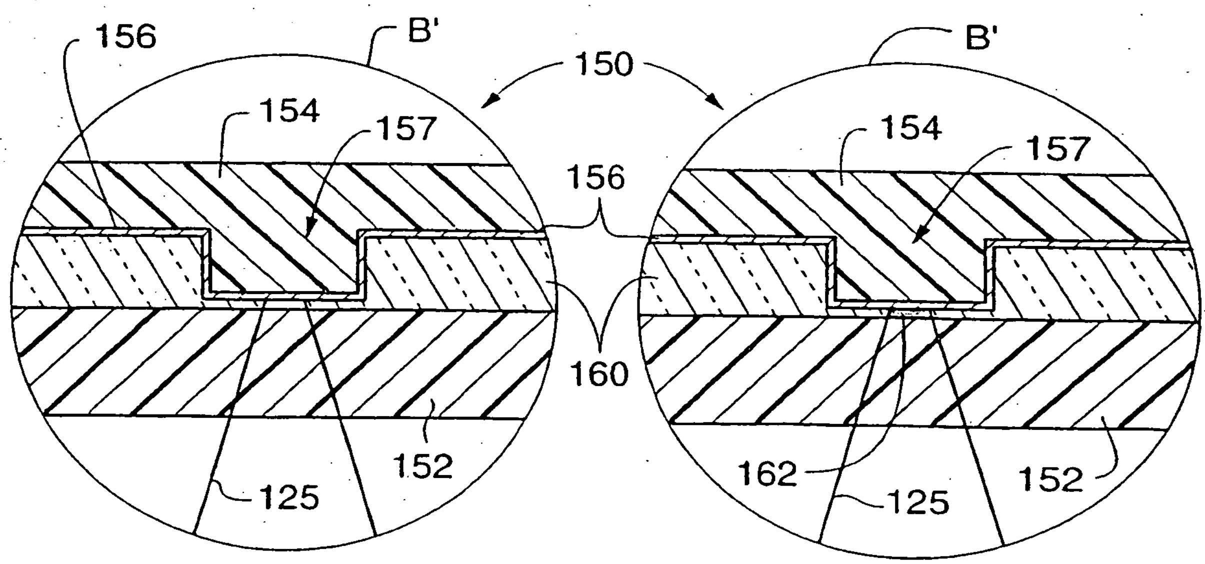

Fig. 7A Fig. 7B

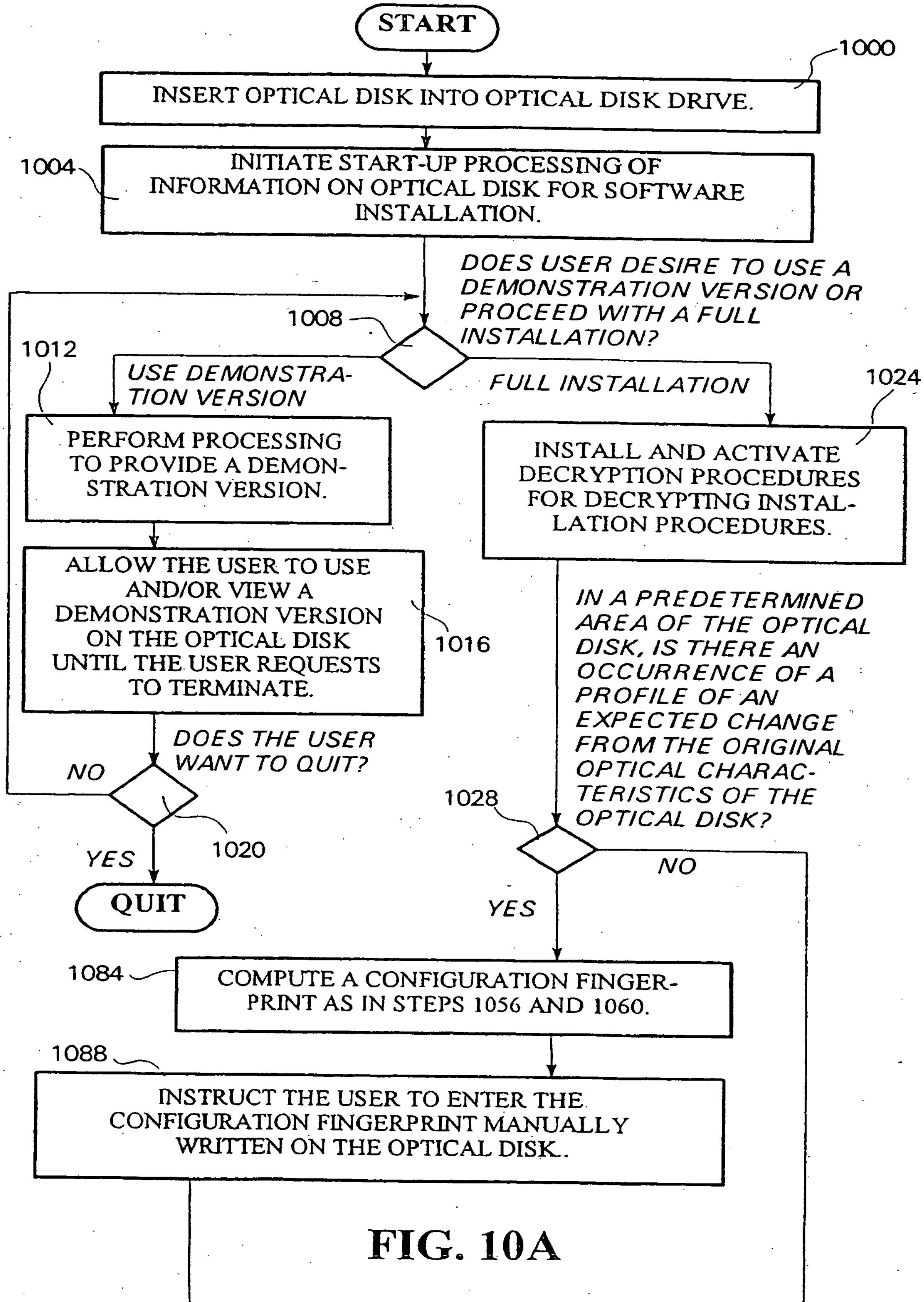
START
1000
INSERT OPTICAL DISK INTO OPTICAL DISK DRIVE.
1004
INITIATE START-UP PROCESSING OF INFORMATION ON OPTICAL DISK FOR SOFTWARE INSTALLATION.
DOES USER DESIRE TO USE A DEMONSTRATION VERSION OR PROCEED WITH A FULL INSTALLATION?
1008
1012
USE DEMONSTRATION VERSION
FULL INSTALLATION
1024
PERFORM PROCESSING TO PROVIDE A DEMONSTRATION VERSION.
INSTALL AND ACTIVATE DECRYPTION PROCEDURES FOR DECRYPTING INSTALLATION PROCEDURES.
ALLOW THE USER TO USE AND/OR VIEW A DEMONSTRATION VERSION ON THE OPTICAL DISK UNTIL THE USER REQUESTS TO TERMINATE.
1016
IN A PREDETERMINED AREA OF THE OPTICAL DISK, IS THERE AN OCCURRENCE OF A PROFILE OF AN EXPECTED CHANGE FROM THE ORIGINAL OPTICAL CHARACTERISTICS OF THE OPTICAL DISK?
DOES THE USER WANT TO QUIT?
NO
1028
1020
YES
NO
QUIT
YES
1084
COMPUTE A CONFIGURATION FINGERPRINT AS IN STEPS 1056 AND 1060.
1088
INSTRUCT THE USER TO ENTER THE CONFIGURATION FINGERPRINT MANUALLY WRITTEN ON THE OPTICAL DISK.

FIG. 10A

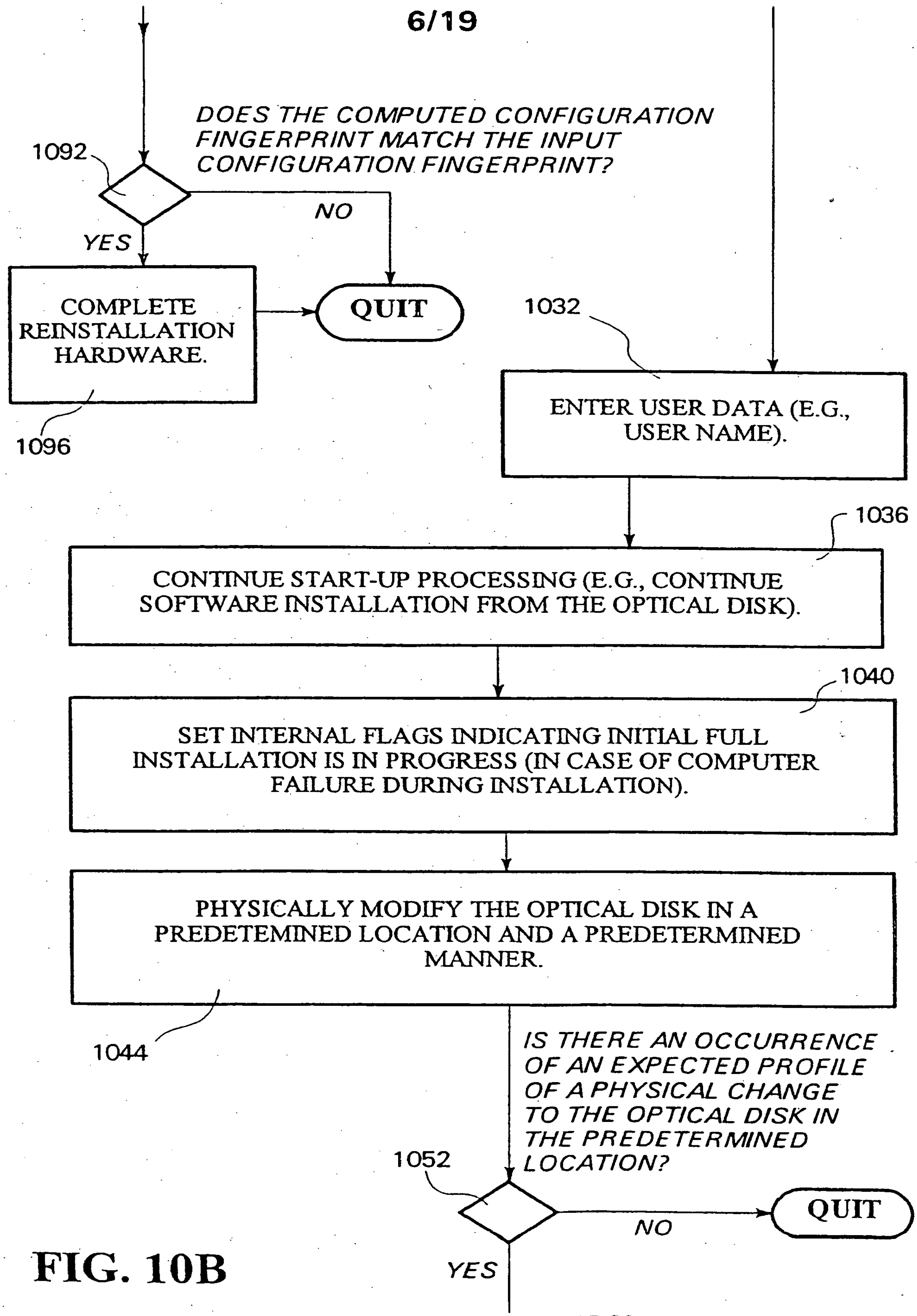
DOES THE COMPUTED CONFIGURATION FINGERPRINT MATCH THE INPUT CONFIGURATION FINGERPRINT?
1092
NO
YES
COMPLETE REINSTALLATION HARDWARE.
QUIT
1096
1032
ENTER USER DATA (E.G., USER NAME).
1036
CONTINUE START-UP PROCESSING (E.G., CONTINUE SOFTWARE INSTALLATION FROM THE OPTICAL DISK).
1040
SET INTERNAL FLAGS INDICATING INITIAL FULL INSTALLATION IS IN PROGRESS (IN CASE OF COMPUTER FAILURE DURING INSTALLATION).
PHYSICALLY MODIFY THE OPTICAL DISK IN A PREDETEMINED LOCATION AND A PREDETERMINED MANNER.
1044
IS THERE AN OCCURRENCE OF AN EXPECTED PROFILE OF A PHYSICAL CHANGE TO THE OPTICAL DISK IN THE PREDETERMINED LOCATION?
1052
NO
QUIT
YES

FIG. 10B

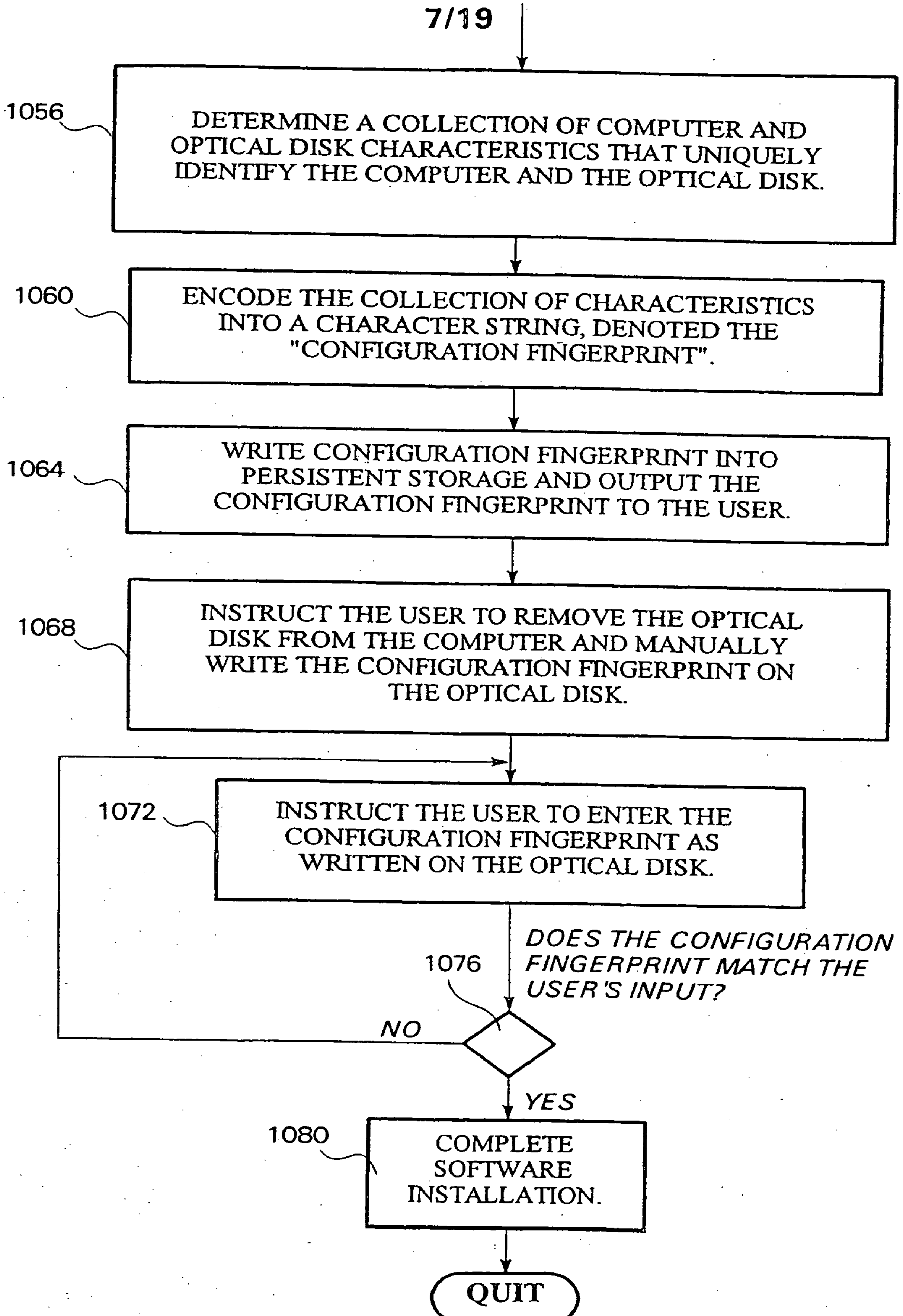
1056
DETERMINE A COLLECTION OF COMPUTER AND OPTICAL DISK CHARACTERISTICS THAT UNIQUELY IDENTIFY THE COMPUTER AND THE OPTICAL DISK.
1060
ENCODE THE COLLECTION OF CHARACTERISTICS INTO A CHARACTER STRING, DENOTED THE "CONFIGURATION FINGERPRINT".
1064
WRITE CONFIGURATION FINGERPRINT INTO PERSISTENT STORAGE AND OUTPUT THE CONFIGURATION FINGERPRINT TO THE USER.
1068
INSTRUCT THE USER TO REMOVE THE OPTICAL DISK FROM THE COMPUTER AND MANUALLY WRITE THE CONFIGURATION FINGERPRINT ON THE OPTICAL DISK.
1072
INSTRUCT THE USER TO ENTER THE CONFIGURATION FINGERPRINT AS WRITTEN ON THE OPTICAL DISK.
DOES THE CONFIGURATION FINGERPRINT MATCH THE USER'S INPUT?
1076
NO
YES
1080
COMPLETE SOFTWARE INSTALLATION.
QUIT

FIG. 10C

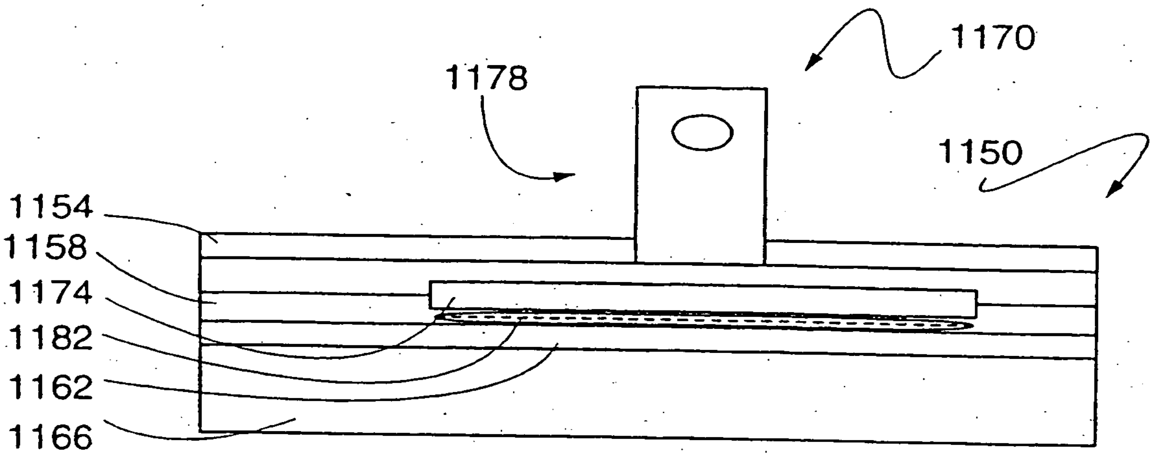

Fig. 11A

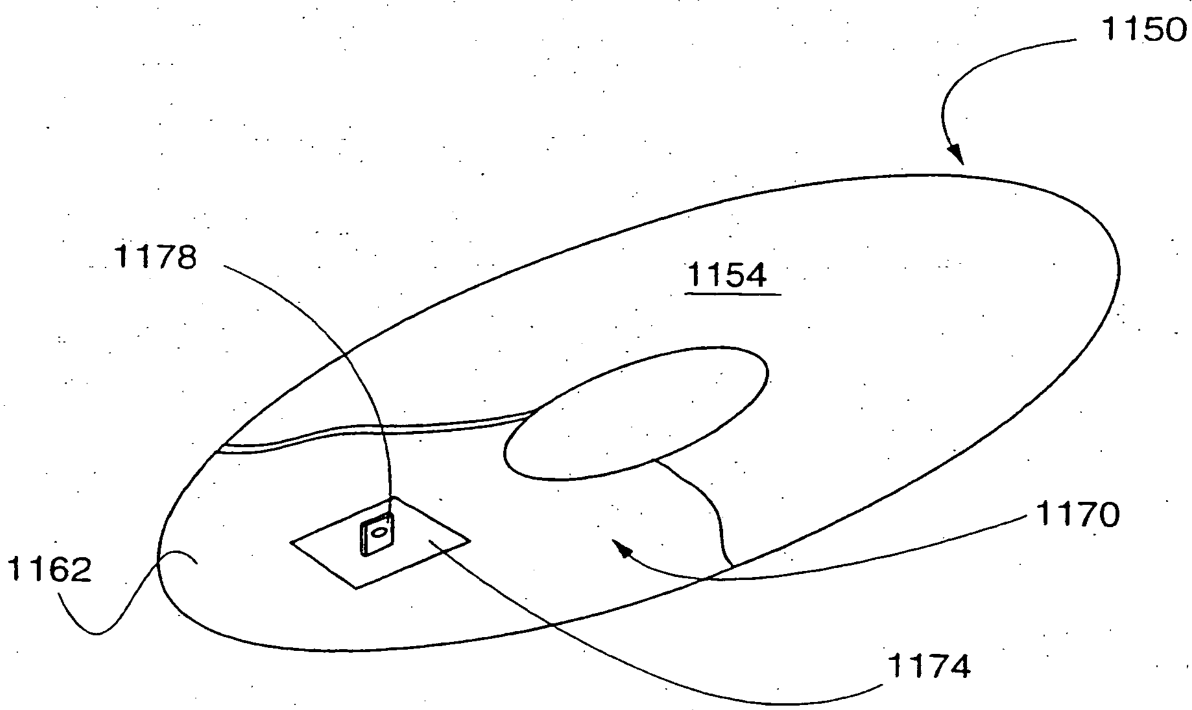

Fig. 11B

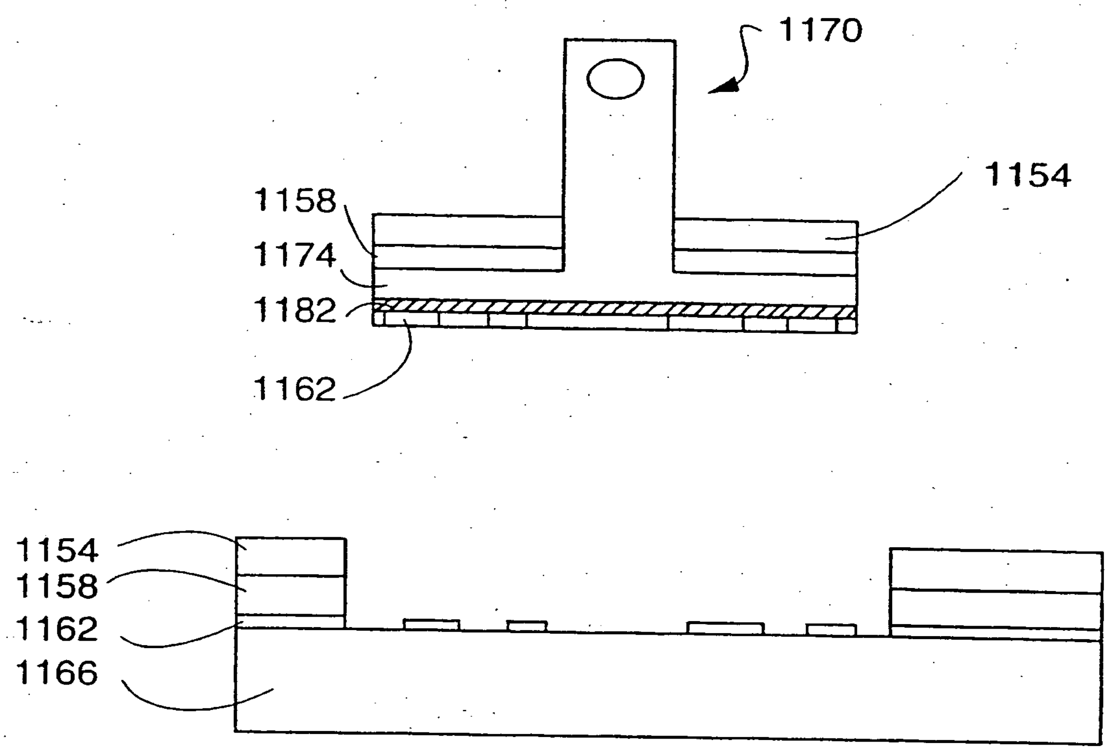

FIG. 12

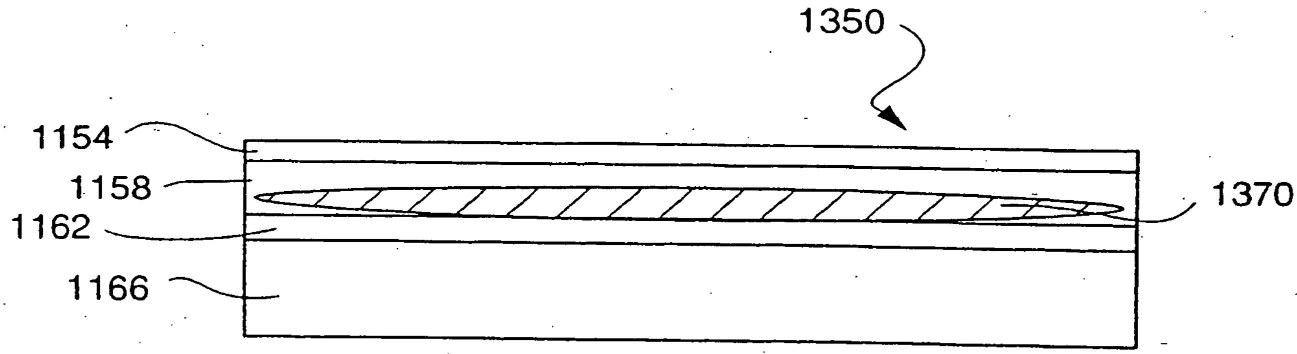

Fig. 13A

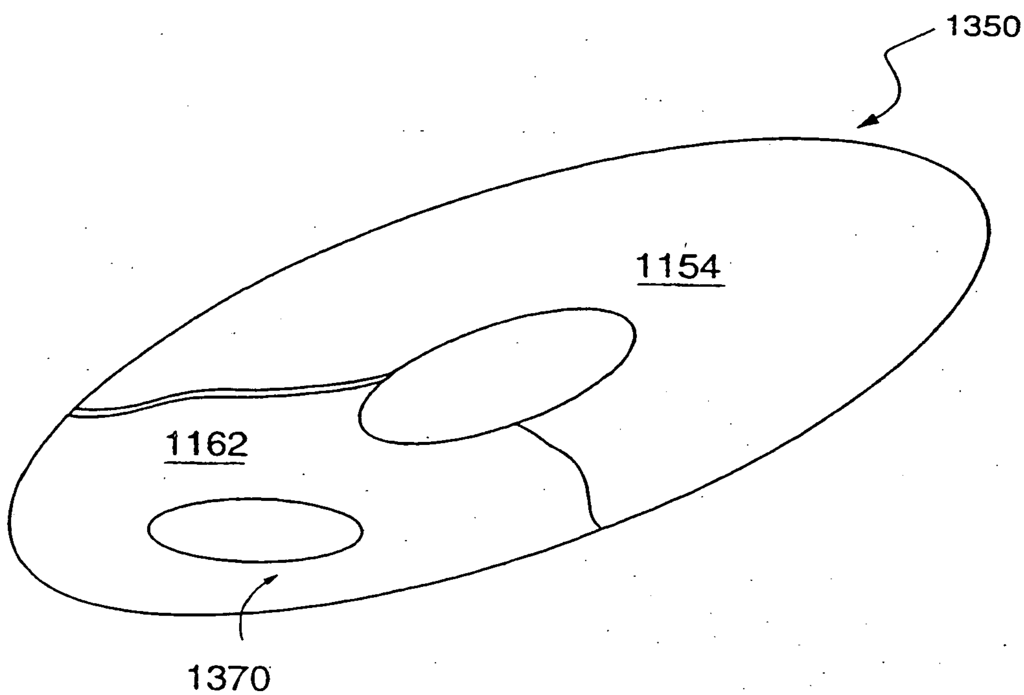

Fig. 13B

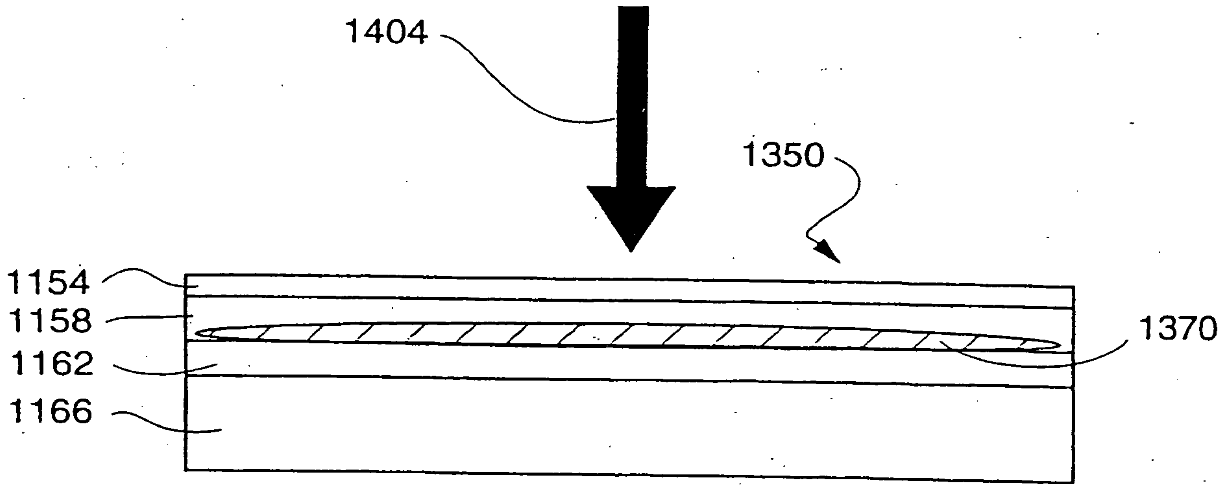

Fig. 14A

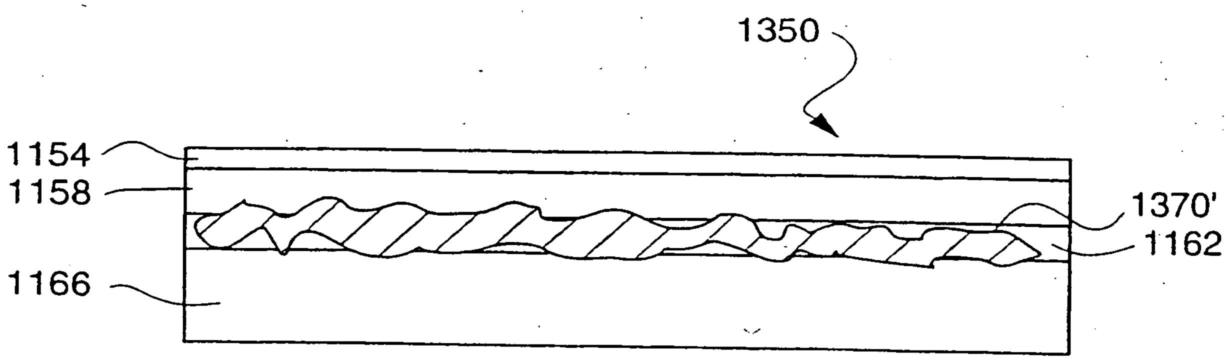

Fig. 14B

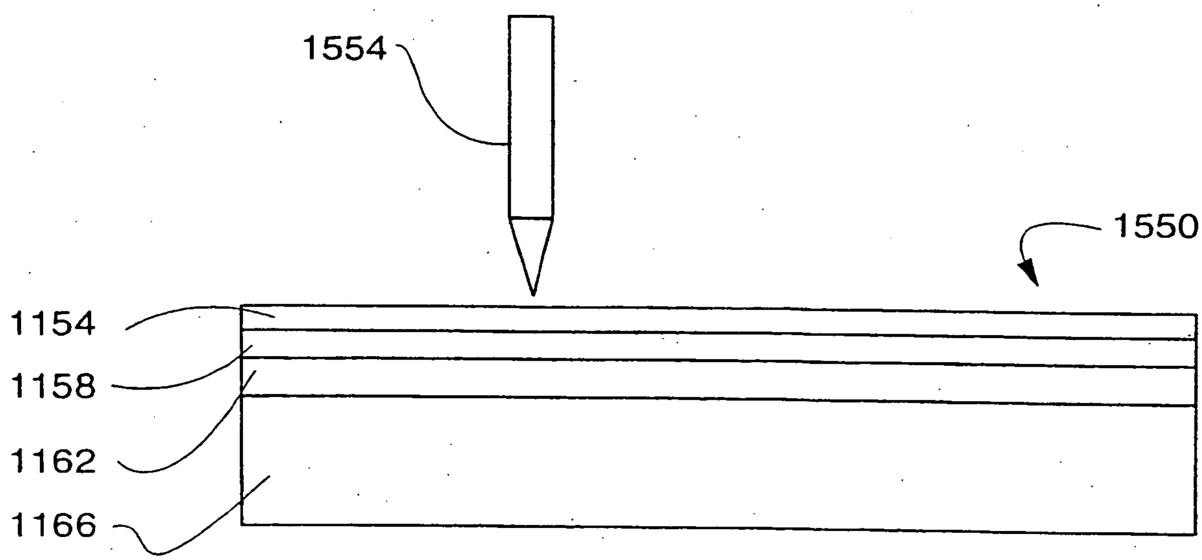

Fig. 15A

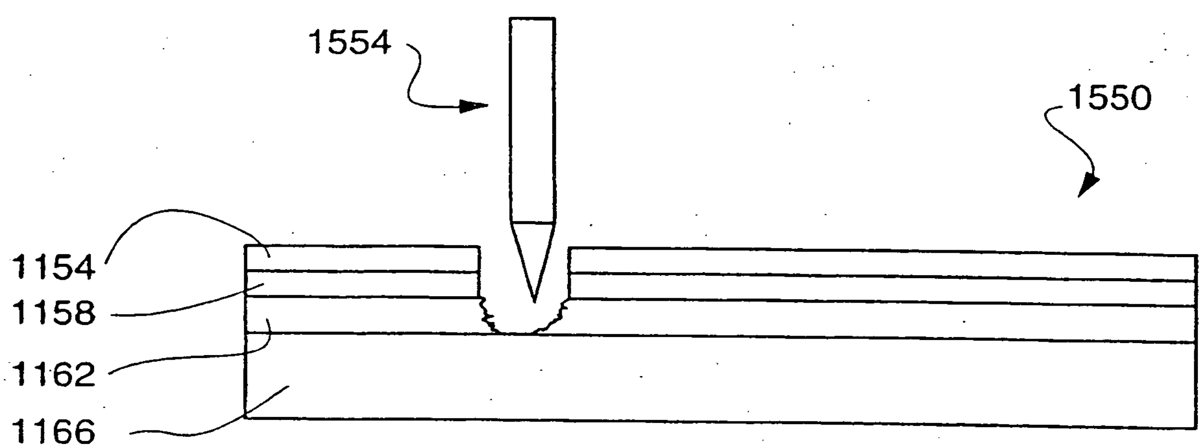

Fig. 15B

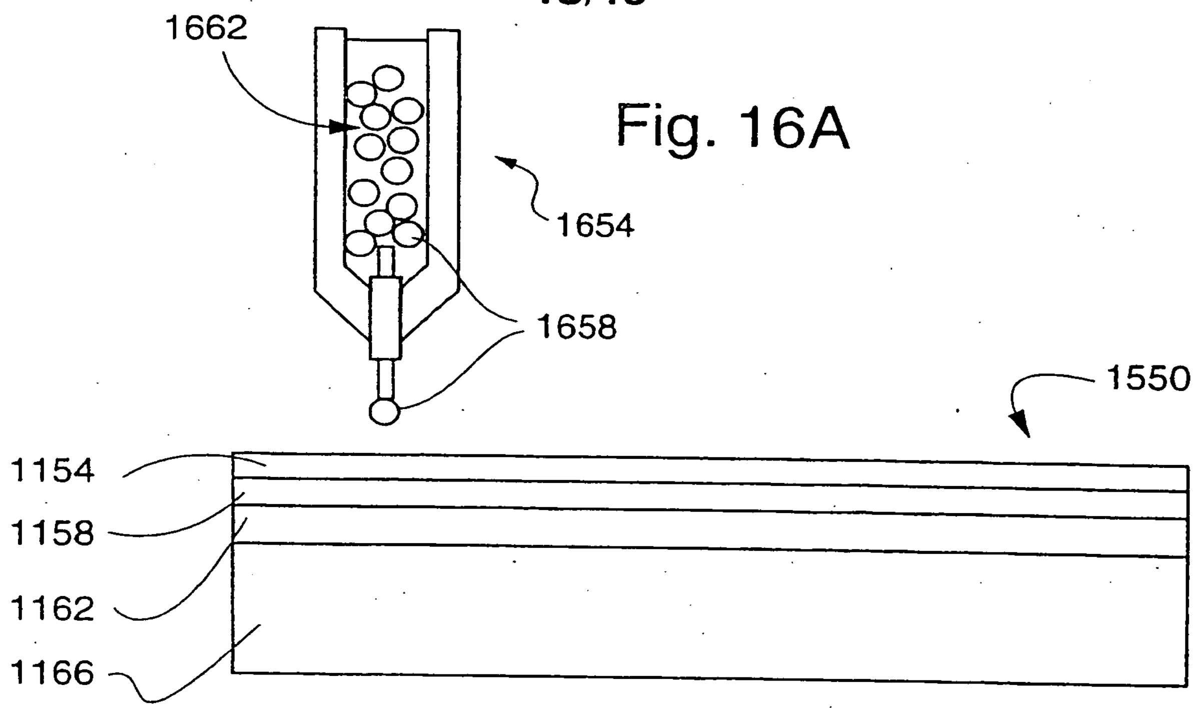

Fig. 16A

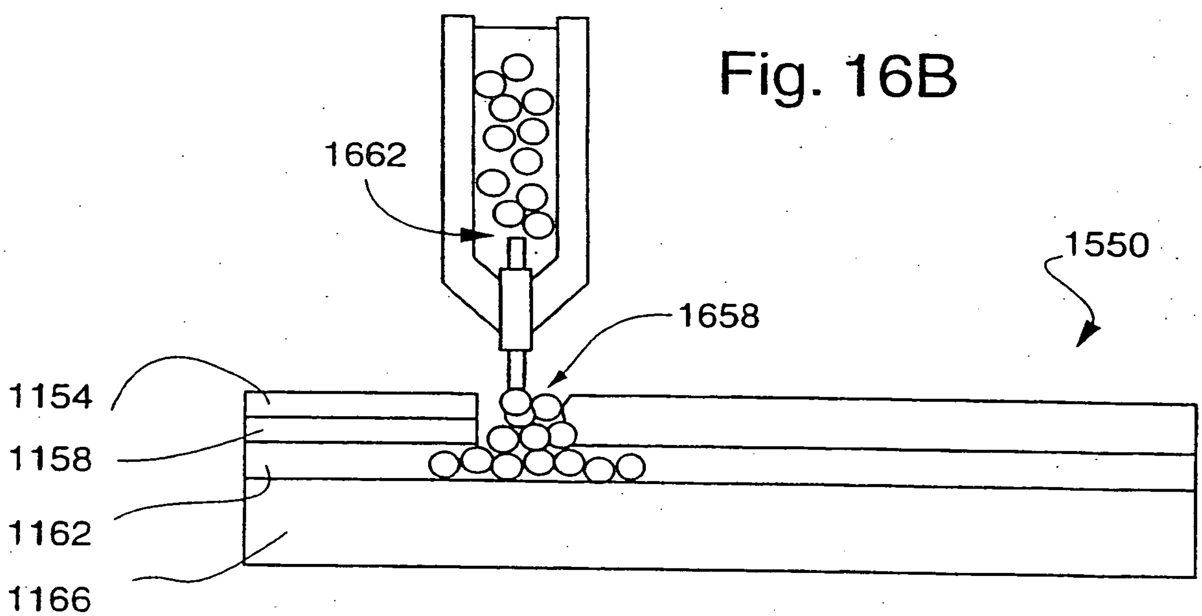

Fig. 16B

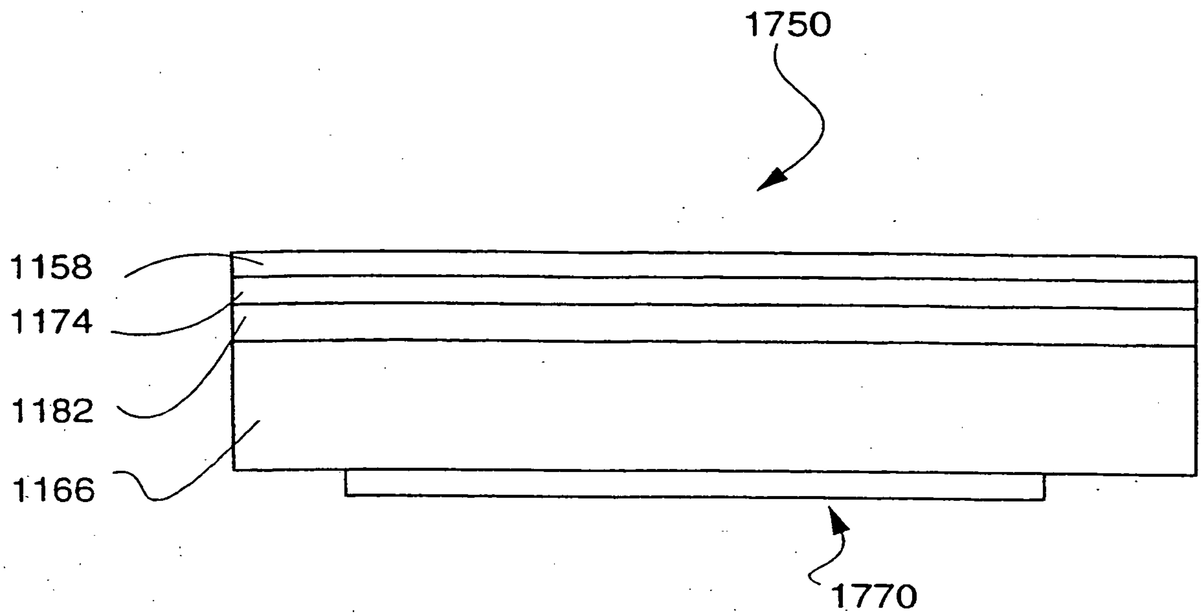

Fig. 17A

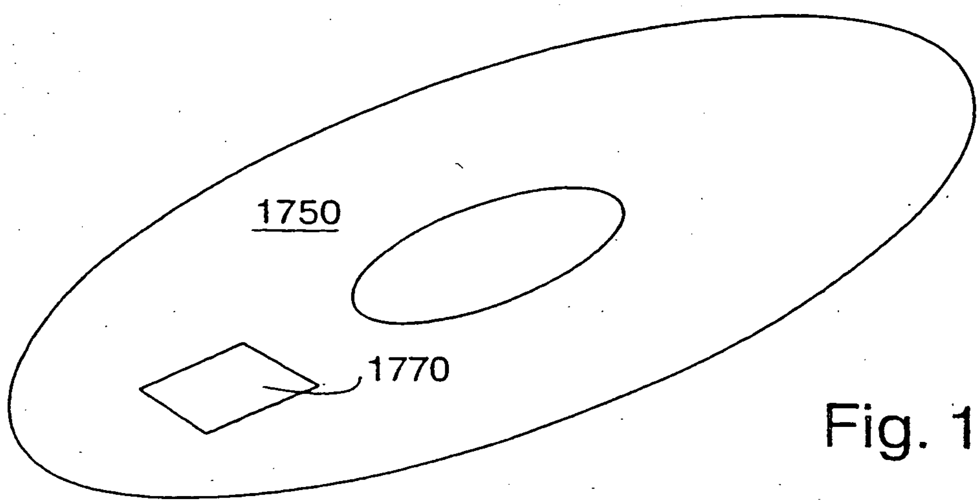

Fig. 17B

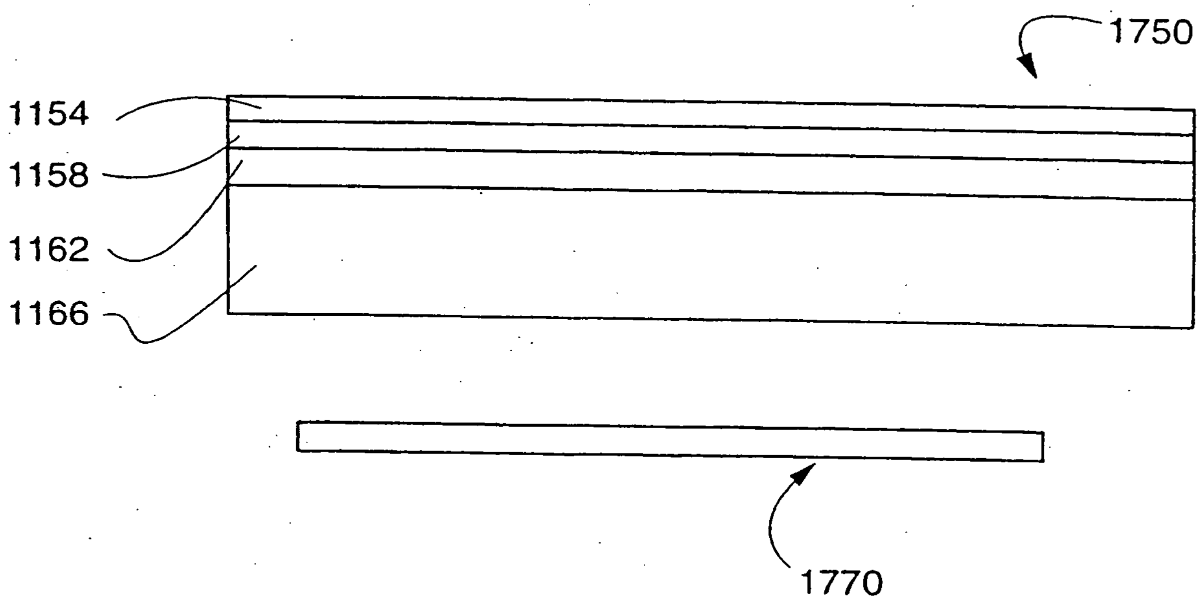

Fig. 18

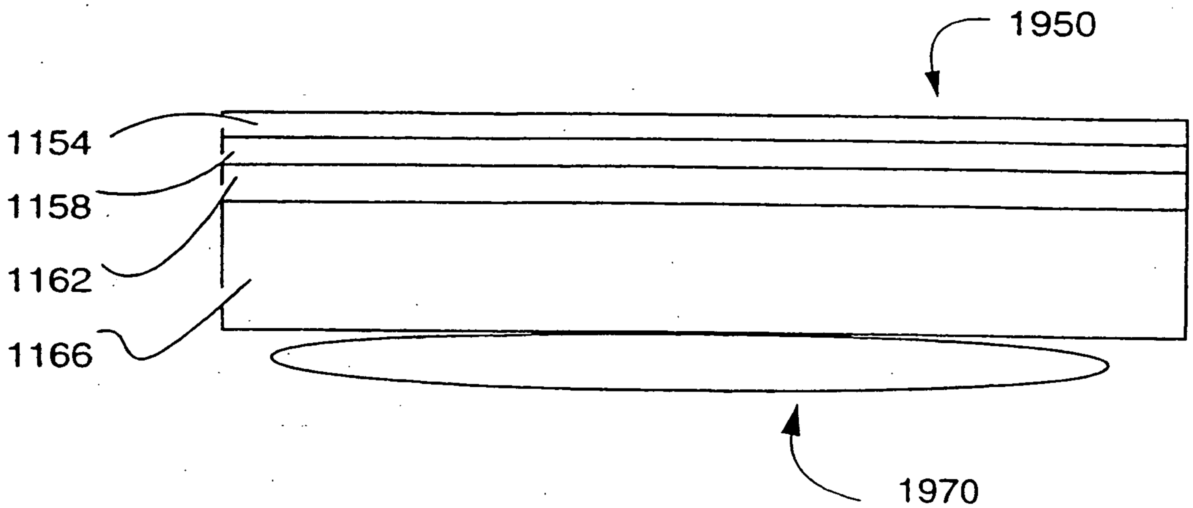

Fig. 19A

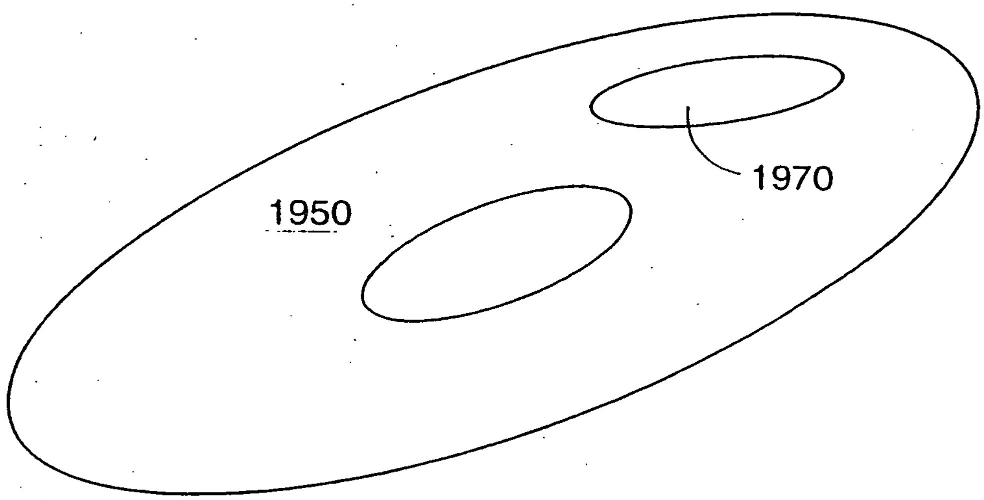

Fig. 19B

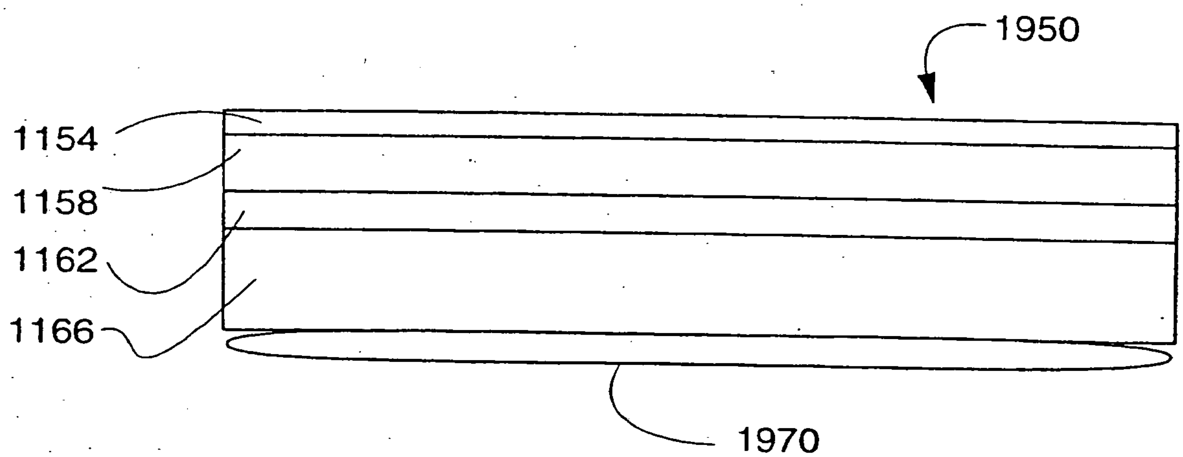

Fig. 20

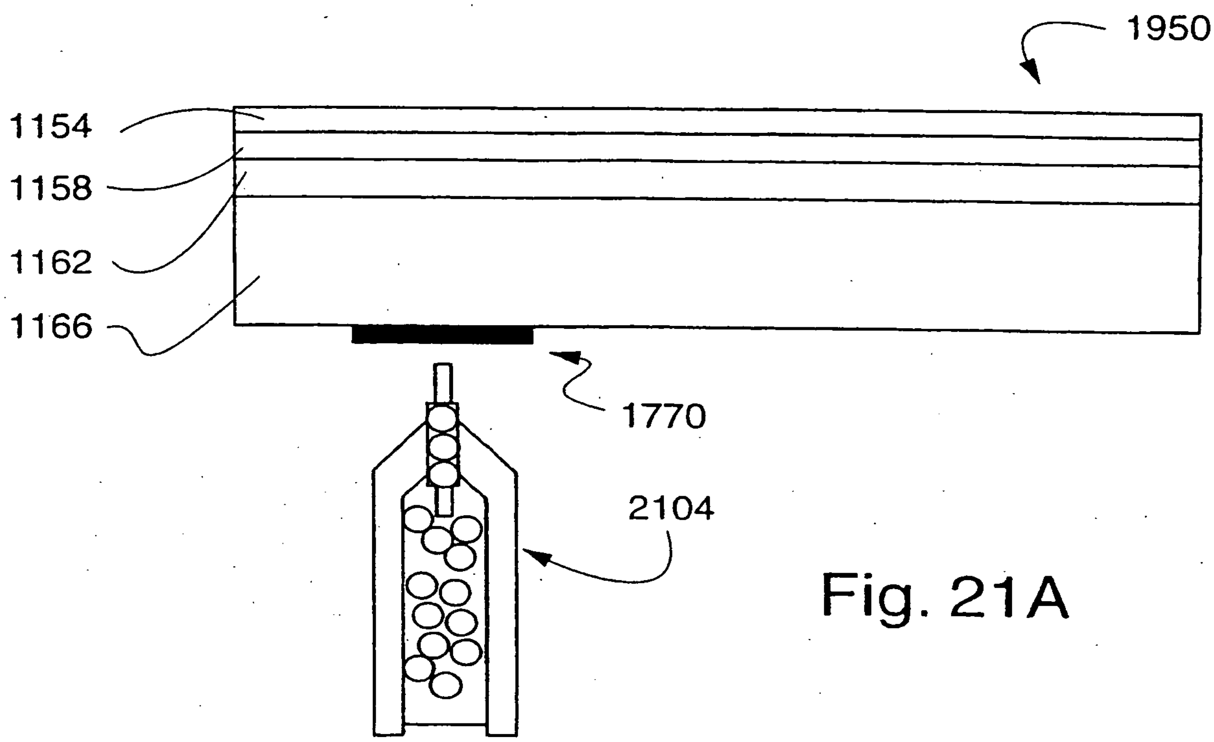

Fig. 21A

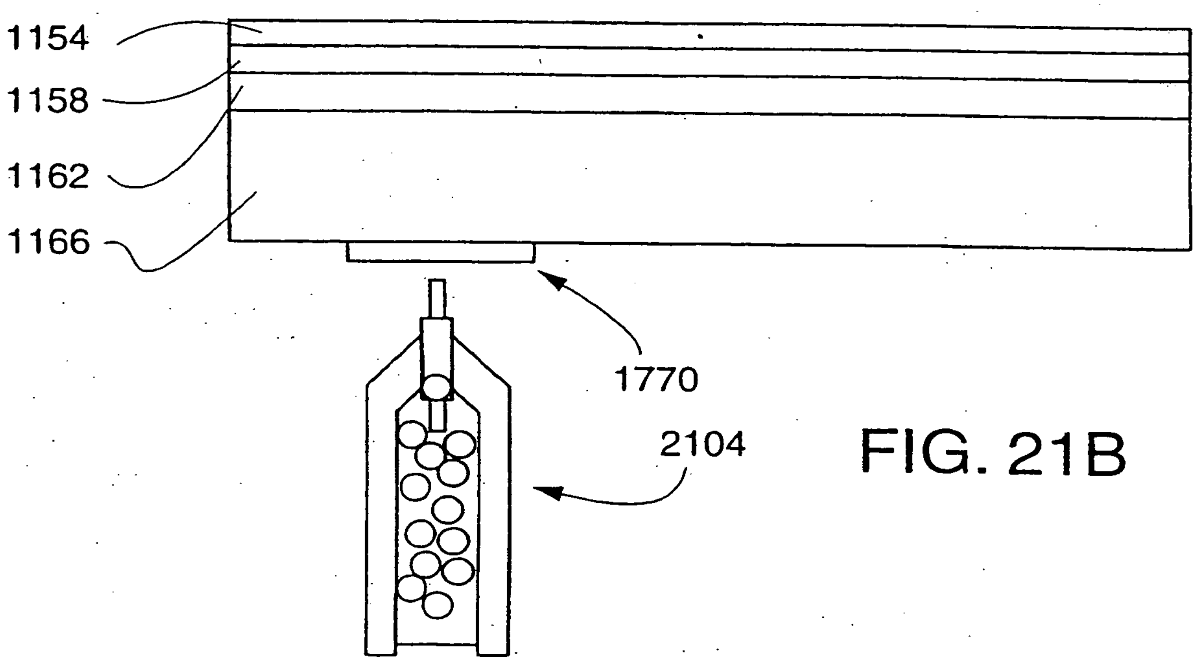

FIG. 21B

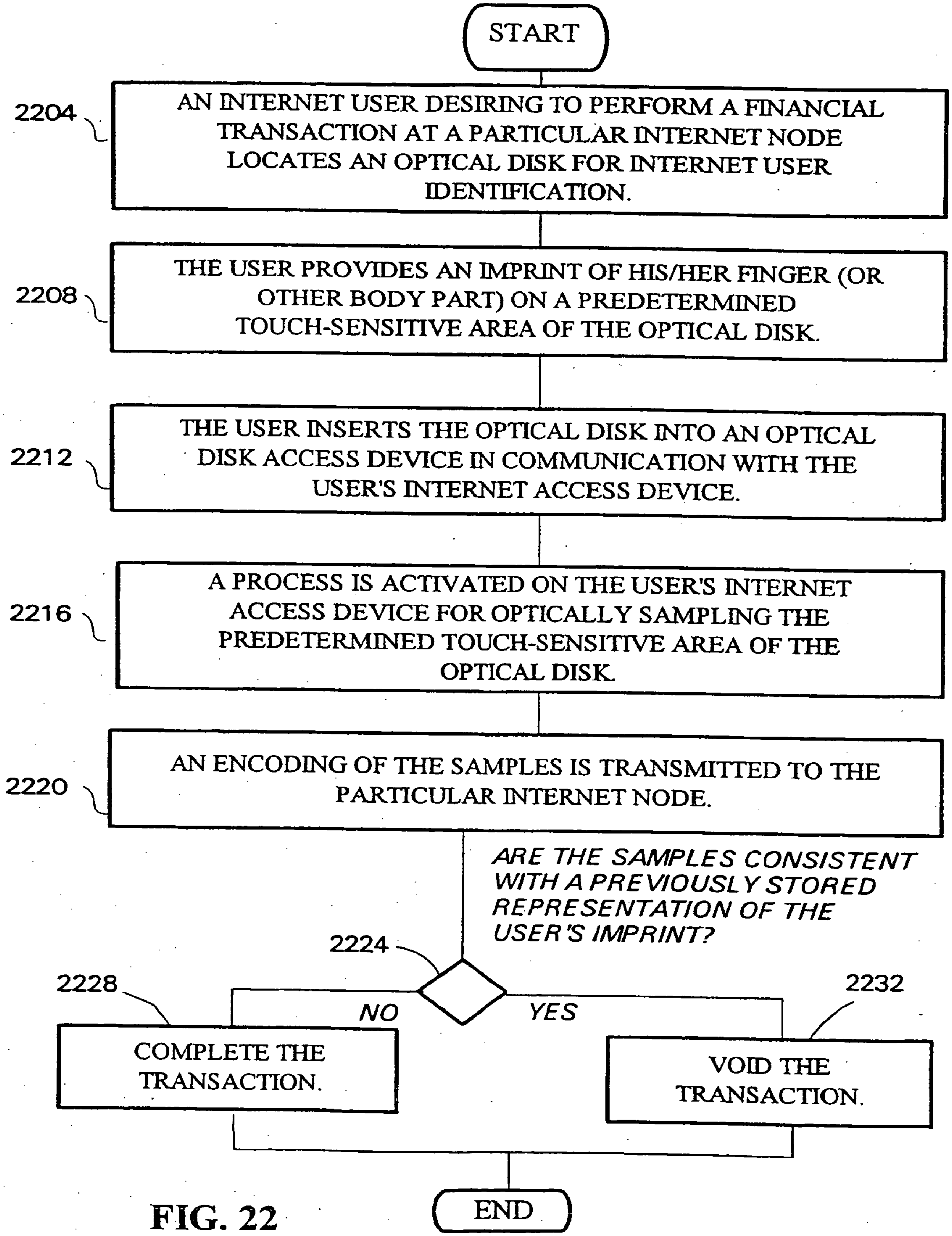
START
2204
AN INTERNET USER DESIRING TO PERFORM A FINANCIAL TRANSACTION AT A PARTICULAR INTERNET NODE LOCATES AN OPTICAL DISK FOR INTERNET USER IDENTIFICATION.
2208
THE USER PROVIDES AN IMPRINT OF HIS/HER FINGER (OR OTHER BODY PART) ON A PREDETERMINED TOUCH-SENSITIVE AREA OF THE OPTICAL DISK.
2212
THE USER INSERTS THE OPTICAL DISK INTO AN OPTICAL DISK ACCESS DEVICE IN COMMUNICATION WITH THE USER'S INTERNET ACCESS DEVICE.
2216
A PROCESS IS ACTIVATED ON THE USER'S INTERNET ACCESS DEVICE FOR OPTICALLY SAMPLING THE PREDETERMINED TOUCH-SENSITIVE AREA OF THE OPTICAL DISK.
2220
AN ENCODING OF THE SAMPLES IS TRANSMITTED TO THE PARTICULAR INTERNET NODE.
ARE THE SAMPLES CONSISTENT WITH A PREVIOUSLY STORED REPRESENTATION OF THE USER'S IMPRINT?
2224
2228
NO
YES
2232
COMPLETE THE TRANSACTION.
VOID THE TRANSACTION.
END

FIG. 22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/08842

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G11B 3/00, 3/90, 5/027, 5/09, 7/00, 7/24, 7/26, 17/22
US CL : 369/33, 47, 58, 124, 127, 174, 275.1, 284
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 369/32, 33, 47, 48, 52, 54, 58, 84, 124, 127, 174, 273, 275.1, 275.3, 275.4, 275.5, 284

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
APS
search terms: copy?(20a)(protect? or prevent?); (dis# or medium)(20a)(code or embed? or mark)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, E	US 5,671,202 A [BROWNSTEIN et al) 23 September 1997, entire document	29-109
Y, E	US 5,661,703 A [MORIBE et al] 26 August 1997, entire document	1-109
A	US 5,608,717 A [ITO et al] 04 March 1997, entire document	1-109
A	US 5,587,984 A [OWA et al] 24 December 1996, entire document	1-109
A	US 5,538,773 A [KONDO] 23 July 1996, entire document	1-109
Y	US 5,400,319 A [FITE et al] 21 March 1995, entire document	1-109

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 OCTOBER 1997	13 NOV 1997

Name and mailing address of the ISA/US	Authorized officer
Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	PAUL W. HUBER
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/08842

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,677,604 A [SELBY, III et al] 30 June 1987, entire document	1-109

Form PCT/ISA/210 (continuation of second sheet)(July 1992)*